Amendments to the Specification.

In this specification, please replace paragraph 1 with the following paragraph:

In order to provide a finished look to substrates, such as woodworking and cabinets, coatings are applied to the substrate. Typically, the finish on wood products ~~are~~ is made up of four components, a toner, a stain, a sealer and a topcoat. The toner is applied to the substrate to ensure an even rate of absorption of stain on the wood, thereby preventing undesirable color contrasts. The stain is applied to achieve the desired color of the end product. The sealer coat is then applied, followed ~~up~~ by a topcoat. ~~The sealer and topcoat are both clear coats and typically include organic based solvents and/or water as a diluent.~~ Typically the sealer and topcoat are clear organic polymer materials in which the active ingredients are present as a fine suspension of liquid droplets in a carrier,- or solvent. The carrier or solvent frequently comprises 60 – 70% of the total. The carrier is a volatile organic liquid or mixture of liquids and may also contain water. The active ingredients commonly are referred to as "solids" even though they are usually liquid at room temperature prior to application. ~~In some instances the topcoat and sealer are reduced organic solvent content materials or water based, which also contain some organic solvent content.~~ After the sealer or topcoat has been applied in the liquid state, a 'curing' process takes place in which the solvent evaporates and the "solids" component dries to a solid and/or undergoes a chemical crosslinking process. The sealer and topcoats provide a glossy finish and provide protection against the application, or absorption, of additional materials by filling the pores of the wood. Figure 1 is a picture of an example wood substrate, a cabinet door.

Replace paragraph 3 with following paragraph:

Traditionally, the finishing coatings are sprayed onto the substrate. Wet applications result in a "wet" coating thickness of three to four thousandths of an inch or "mils." ~~That~~ This is reduced to one mil after the material is dried or cured, usually in a thermal operation. The process takes approximately one to three hours from toner application to the curing of topcoat. Thereafter, the substrates cannot be stacked or otherwise come in contact with each other or anything else for an additional four to eight hours to prevent "sticking."

Additionally, these traditional methods of wood coating are significantly ~~e~~affected by ambient conditions, particularly temperature and humidity. Moisture causes an undesirable "rising" of the wood grain due to the process of hydration. Hydration is a process ~~by which~~ whereby the cells of the substrate absorb water. Hydration of the wood grain cells results in a non-uniform volume expansion of the substrate. Specifically with a sanded wood substrate, the wood grain will rise and a "feathering" of the surface will result in an uneven, rough appearance. Although any low viscosity liquid that is allowed to "dive into" the pores of the wood can result in an expansion of the substrate, in the absence of hydration, this expansion is quite often negligible. Furthermore, many traditional coating technologies, whether organic solvent or water-based, utilize electrostatic coating systems. Salt water mist is ~~added to these components to allow for electrical conductivity.~~ applied to substrates prior to painting to provide the necessary conductivity. The amount of mist applied is based in part on the system design and the ambient humidity. Thus system performance can vary based on the surrounding environmental conditions.

Replace paragraph 9 with the following paragraph:

~~The~~ Prior to the current invention, it was already is technically feasible to apply 100 percent solids coatings, ~~like~~ including ~~the~~ solvent-based coatings, ~~can be applied,~~ at a 'conventional' build thickness of, approximately, two to four mils ~~build thickness prior to cure utilizing various spray application technologies that are currently available~~ using well known conventional spray application techniques including conventional airless, air-assisted-airless and high volume low pressure (HVLP) technologies. However, for clear coatings the resulting appearance of the finished article was frequently unacceptable. Since there is little or no reduction of thickness during the curing of 100% solids material, the coating on the finished article appears too thick, creating an undesirable "plastic coated" appearance. ~~If 100 percent solids coatings are applied utilizing spray application technologies that are currently available and then curred with uv radiation, the cured film thickness would also be two to four mils. This results in an undesirable appearance of the finished product, as it would appear "thick" and "plastic coated.: As such, use of conventional spraying techniques, such as conventional airless, air-assisted airless and high volume low pressure (HVLP) technologies, to apply 100 perecent solids coatings does not~~

~~provide for adequate results. The coatings in the two to four mil wet coating range resulted in a "thick" appearance on large, two dimensional surfaces and thin, non uniform coatings on surfaces that were not perpendicular to the point of dispensation.~~ Moreover, in regions on the substrate such as recesses where the deposition rate of coating droplets is below average and droplets are sparsely distributed, the high viscosity of the 100% solids material can prevent individual droplets from coalescing or "knitting" properly to create a level finished layer. Consequently the finish in these regions can have an unacceptable 'dry' or 'rough' appearance. Such areas on wood cabinet doors are the recessed areas along the side and top rails.

Replace paragraph 10 with the following paragraph:

"Thin films" (0.2 mils to 2 mils) are not typically ~~desired~~ specified when using conventional organic solvent or water-based coatings due to poor appearance after cure. The finished product appears dry, blotchy, or uncoated. Thin films of 100 percent solids coatings do present a desirable appearance if applied uniformly, simply because the cured film thickness is equal to the uncured or wet film thickness. Prior to the current invention, ~~Thin~~ thin and even film coatings of 100 percent solids coatings ~~are~~ were readily achievable utilizing several application technologies, such as vacuum coating, curtain coating, and roll-on applicators. These technologies, however, are only viable on two-dimensional substrates since the coatings are difficult to apply to edges, corners and cracks in the substrate. Examples of substrates coated with these techniques include linear wood cabinet components and wood flooring. In order to use these technologies on three dimensional substrates, the coatings are applied in larger quantities than needed, thereby producing waste of the coatings and an uneven application of the coating on the substrate. ~~Also~~ Moreover, prior to the current invention some application technologies ~~are~~ were simply not suitable for thin coatings of 100% solids material onto a 3-dimensional substrate. ~~Thin-film spray application of 100 percent solids coatings has~~ In particular, spray application ~~typically~~ was usually unsuccessful, typically ~~resulted~~ resulting in blotchy, dry, and uneven coating appearances. ~~Furthermore, the~~ The coating failed to evenly enter areas of the substrates where there were not a perpendicular surface to the point of dispensation. Inadequate coverage ~~was~~ is produced in recessed areas, while in large flat, open areas droplets of the 100 percent solids material ~~does not~~ would fail to coalesce ~~"knit"~~ to form a cohesive coating.

Replace paragraph 7 with the following paragraph:

Figure 7 is a graphical representation of the adiabatic effects experienced using the Can-Am-type gun and the Sata-Type gun.

Replace paragraph 13 with the following paragraph:

Figure 13 illustrates the coating spray pattern from a coating gun and the displacement of air by the spray spray pattern.

Replace paragraph 27 with the following paragraph:

The process of this application provides for improved "knitting" of 100 percent solids coatings to match that of conventional solvent-based coatings. "Knitting" of the coating refers to the ~~flow of~~ merging of individual droplets of the material to form a uniform thin film. For example, wood and metal surfaces where "knitting" failures are evident appear to have small "specks" of material that stand up on the substrate and do not flow out. The process of this application further provides for improved coating build on recessed or non-planar surfaces. Furthermore, the process described herein maximizes transfer efficiency of the material. These significant improvements in the 100 percent solids coatings application provide for a uniform thin film build on three-dimensional surfaces. The details of the process are further described below.

Replace paragraph 35 with the following paragraph:

The guns **30** are used to apply the coating material, atomize the coating, distribute the coating, and deliver the coating to the substrate **40**. Component parts of typical high precision coating guns are shown in Figure 4. Coating guns **30** generally consist of a body **50**, valving **52**, a material flow control apparatus **53** a coating nozzle **55** located on a gun head, coating input **58**, air input **60** and side nozzle, or horn, **62**. The gun shown in Figure 4 is an illustrative example of a conventional high volume low pressure (HVLP) gun, such as the SATA LP™ jet K3™ HVLP. As shown in Figure 4 coating material enters the gun chamber **64** through coating input **58**, from a feed line (not shown). Air enters the gun chamber **64** through air input **60**. The coating material is atomized in the gun spray chamber **64** and then carried to the coating nozzle **55** where it is dispensed from the gun. A portion of the air passes through the gun and out side nozzles **62**.

The air that flows out of the side nozzles 62 provides for the spray fan pattern, as described further below. The coating is then sprayed onto a substrate 40, as shown in Figure ~~5~~13, in a controlled fan pattern to provide an even coating. Further details on the operation of a conventional HVLP spray gun can be found in United States Patent Nos. RE36378 issued to Binks Manufacturing Company on November 9, 1999 and 6,585,173 issued to Sata-Farbspritztechnik GmbH & Co. on July 1, 2003, the entire disclosures of which are hereby incorporated by reference.

Replace paragraph 39 with the following paragraph:

One factor that determines the transfer efficiency regardless of the gun that is used is the spray pattern. The side nozzles or fan nozzles 62 ~~are used to effect~~ create the spray pattern. Typically when air is discharged ~~form~~ from the coating nozzle 55, the spray pattern is an ovular cone. ~~As such, in~~ In a single pass for such a cone, the edges of the spray pattern would be lighter than the center portion. In order to obtain a more uniform spray pattern, it is desirable to develop a flatter spray pattern, ideally to form a nearly rectangular footprint. The jets of air from the side nozzles 62 are directed toward one another and at complementary angles such that the radial momentum is cancelled and the pattern from the coating nozzle is flattened. The longitudinal momentum of the atomized particles is not altered by the side nozzles, thereby allowing the particles to continue to be dispersed onto the substrate. Thus, the side nozzles changes the direction of the atomized particles of the coating to create the rectangular footprint of distribution.

Replace paragraph 43 with the following paragraph:

In order to produce the desired optimal results, it was determined that the heat of the atomized spray stream should be between about 80 degrees and about 160 degrees Fahrenheit, and more specifically between about 110 degrees and about 140 degrees Fahrenheit. If the temperature is too ~~hot~~ high several adverse conditions can occur. For example, if too much heat is applied there is a possibility that the substrate could be scorched, the chemical composition of the coating could be adversely ~~effected~~ affected, air could be trapped in the coating thereby creating bubbles, or the substrate could be too absorbent thereby creating dry areas, or areas where the coating soaks into the substrate. Conversely, if the temperature is too cold, there is a possibility that

there could be inadequate flow out thereby not covering the substrate or the coating could blotch or stick to create an undesirable "orange-peel" look. Thus, in order to obtain an optimal output temperature, the effect of adiabatic cooling needs to be accurately balanced with the amount of heat added into the spray system. The effect of adiabatic cooling can be evaluated by conducting calculating ~~a~~ the heat balance across the coating delivery process. ~~The total heat in the process is the sum of the heat due to adiabatic effects plus the heat contained in the air and the heat contained in the liquid. The adiabatic changes influence both the air and liquid. Further studies were conducted to determine the quantity of air passing through the two systems. As the volume of low-pressure air that is employed to deliver the coating to the substrate becomes larger, a larger heat input to the air was required.~~

Replace paragraph 44 with the following paragraph:

The heat ~~mass~~ balance over the system demonstrates the relative impact of each component. approximately 1,000 grams of air pass through the atomization gun per minute[.]; ~~When~~ when heating the atomizing air from 72 degrees Fahrenheit to 150 degrees Fahrenheit per minute, approximately 85 kJ per gun of heat input is required[.]; ~~Approximately~~ approximately 100 grams of coating pass through the atomization gun per minute; ~~When~~ when heating the coating from 72 degrees Fahrenheit to 120 degrees Fahrenheit per minute, approximately 10 kJ per gun of heat input is required. If one assumes that there is approximately 30 cubic feet of air in the immediate vicinity of substrate to be coated, and that the ambient temperature is 110 degrees Fahrenheit, then the heat input required to maintain this temperature would be approximately 11 kJ. It would appear, therefore, that the heat of the atmosphere between the point of atomization and the substrate would have an approximate 10% influence in the total heat to the process. However, when taking into account the rate of airflow from the point of dispensation to the substrate, this influence is almost completely offset by the displacement of ambient air with atomization air. ~~Figure 6~~ Figure 13 graphically demonstrates how atomization air displaces ambient air.

Replace paragraph 45 with the following paragraph:

Figure 7 demonstrates the effects of both adiabatic heating and cooling. Testing was conducted with a Can-Am gun and turbine compressor and with Sata traditional HVLP guns. Figure ~~5~~ 7 is a graphical representation of air stream temperature from a Can-Am system at 8.75 psi and a Sata gun at 40 psi. Also presented are graphs with both guns spraying water at 56 degrees Fahrenheit with a room temperature of 72 degrees Fahrenheit. With the Sata guns, dispensed air and water were cooled well below ambient temperatures and slowly approached ambient temperature over time and distance traveled. With the Can-Am system, the adiabatic heating of the gas/liquid mixture is clearly observed. As it can be seen, the Can-Am system requires less heat to offset the effects of adiabatic cooling.

Replace paragraph 66 with the following paragraph:

At least partly due to the absence of significant amounts of monofunctional acrylate monomers and/or inert solvents, it is believed, certain compositions exhibit reduced volatility as compared to their radiation curable, sprayable counterparts that include such materials. It is believed that monofunctional acrylate monomers not only react into and become part of the coating during cure, but they also evaporate during cure to a greater extent than multi-functional acrylates. Low volatility results in reduced odor, safer handling, and recyclability.

Replace paragraph 93 with the following paragraph:

~~When~~ Although substrate preheating is beneficial, heat ~~is applied to the substrate, it should be~~ must be applied in a controlled and measured manner to ensure that the substrate is not adversely ~~effected~~ affected. For example, wood is a porous material having a significant water content; ~~and as such~~ extreme heating ~~will~~ can cause material degradation, including drying, splitting, and combustion. Extreme heating ~~would also provide for~~ often is associated with uneven flow out, leaving areas of the substrate dry or uncoated. High heating ~~will~~ can also cause the wood ~~will~~ to "off gas" ~~which will result~~ resulting in holes in the finished surface. ~~If~~ Conversely, if the substrate is too cool, ~~the contact angle~~ both the viscosity of the coating ~~hitting~~ and its contact angle on the surface ~~is~~ may become too high[.] ~~And the coating will have reduced flow, which~~

~~will result in a change in rheology and~~ resulting in an unacceptable appearance. Flow out ~~will~~ does not occur ~~resulting in~~ and the consequence is a rough, uneven or "orange peel" appearance. In the case of non-wood or non-porous substrates, the rough, uneven appearance would still be a concern for cooler substrate temperatures.

Replace paragraph 96 with the following paragraph:

Many different types of applicators can be used to implement the process and produce the product as described herein. Examples of such applicators as those made by Dubois Equipment Co., Inc., Superfici Inc., and Cefla Group. The general components of the applicator ~~is~~ are set forth above and Figure 12 is a photograph of a Dubois Mist Coater. It should be noted that a variety of applicators can be used. For example the applicator can be (1) a hand held spray which is applied to a fixed substrate; (2) a horizontal fixed spray head with the substrate on a conveying system; (3) a horizontal reciprocating spray head with the substrate on a conveying system; (4) a vertical, or hanging, reciprocating spray head with the substrate on a conveying system; (5) a vertical, or hanging, articulating spray head with the substrate on a conveying system; or (6) any other mechanism in which the sprayers can encounter the substrate in a uniform manner. Furthermore, it should be noted that any one of these applicators can be used in connection with a recirculation system to ensure high levels of transfer efficiency. However, it is preferred to maximize the transfer efficiency on the first pass, as recirculated coating particles will be subject to increased stress and shear which may adversely effect the look of the finished product.

Replace paragraph 98 with the following paragraph:

As mentioned above, controlling the temperature of the air supplied to the chamber ~~temperature control~~ is not nearly as critical as ~~the control of other~~ controlling the temperatures[.] of the other fluids in the system. This is because there is not as much heat lost to the surrounding air, and more importantly, due to the positive displacement of the air by the atomized stream. The displacement of air is illustrated in Figure 13. It is preferred to use heated air within the spray chamber, preferably between about 80 degrees and about 160 degrees Fahrenheit, and more preferably between about 110 and about 130 degrees Fahrenheit. The heat for the chamber air

may come from other portions of the spraying system, such as, for example, from the UV oven. Such use of the air not only saves in the amount of input heat, but also generates less waste streams.

Replace paragraph 112 with the following paragraph:

A horizontally reciprocating coating machine or 'reciprocator'™, ~~reciprocator~~, such as a Cefla Easy 2000™, or Superfici Twin Spray, can be used in place of the Mist Coater. The guns and flow equipment would be the same. The reciprocator is significantly different than the Mist Coater, because reciprocators use electric eyes to locate the substrate, and then only coat those areas. Hence the substrate can be sprayed with a thin and uniform coating using a 100 percent solids coating, a solvent coating, or a waterborne coating.

Replace paragraph 120 with the following paragraph:

The coating temperature can be enhanced by the additional heating within the spray gun. This can be achieved by delivering the atomization air at an elevated temperature. It has been measured, as with a turbine-air gun, that the gun has 7 cc of coating flowing within it at all times. At a ~~deliverance~~ delivery of 3 oz/minute, this can result in a gun heating time of 6-7 seconds within the gun. Since nearly ten-times as much mass of air than coating is used in the gun, the air acts as a near-infinite source of heat at elevated temperature.